

What Is Claimed Is

1. A photoacoustic detector for measuring an analyte gas in an environment, the photoacoustic detector comprising:

a source of optical energy;

a sensing volume, the sensing volume being in fluid connection with the environment through an acoustic pressure attenuating element such that the analyte gas can diffuse into the sensing volume through the acoustic pressure attenuating element; and

an acoustic pressure sensor volume including an acoustic pressure sensor, the acoustic pressure sensor volume being in fluid connection with the sensing volume such that the initial response time of the photoacoustic detector is independent of the size of the acoustic pressure sensor volume relative to the size of the sensing volume.

2. The photoacoustic detector of claim 1 wherein the fluid connection between the acoustic pressure sensor volume and the sensing volume functions as a capillary tube.

3. The photoacoustic detector of claim 1 wherein the fluid connection between the acoustic pressure sensor volume and the sensing volume is placed in close proximity to the acoustic pressure attenuating element.

4. The photoacoustic detector of claim 1 wherein the fluid connection between the acoustic pressure sensor volume and the sensing volume is placed

near a corner of the sensing volume in close proximity to the acoustic pressure attenuating element.

5. The photoacoustic detector of claim 1 wherein the fluid connection between the acoustic pressure sensor volume and the sensing volume is placed near an edge of the sensing volume in close proximity to the acoustic pressure attenuating element.

6. The photoacoustic detector of claim 1 wherein the diffusion rate of the analyte gas from the sensing volume into the acoustic pressure sensor volume through the fluid connection is less than the diffusion rate of the analyte gas from the environment into the sensing volume through the acoustic pressure attenuating element.

7. The photoacoustic detector of claim 1 wherein the fluid connection between the acoustic pressure sensor volume and the sensing volume comprises a flexible membrane.

8. The photoacoustic detector of claim 1 wherein the fluid connection between the acoustic pressure sensor volume and the sensing volume comprises a rigid membrane mounted in a flexible support.

9. The photoacoustic detector of claim 1 wherein the sensing volume and the acoustic pressure sensor volume are similar in size.

10. The photoacoustic detector of claim 1 wherein the sensing volume is less than the acoustic pressure sensor volume.

11. A photoacoustic detector for measuring an analyte gas in an environment, the photoacoustic detector comprising:

a source of optical energy;

a sensing volume, the sensing volume being in fluid connection with the environment through an acoustic pressure attenuating element such that the analyte gas can diffuse into the sensing volume through the acoustic pressure attenuating element;

an acoustic pressure sensor volume including an acoustic pressure sensor; and

a connector between the acoustic pressure sensor volume and the sensing volume such that the diffusion of the analyte gas from the sensing volume to the acoustic pressure sensor volume is controlled without adversely affecting the transmission of the photoacoustic pressure signal between the sensing volume and the acoustic pressure sensor volume.

12. The photoacoustic detector of claim 11 wherein the connector between the acoustic pressure sensor volume and the sensing volume functions as a capillary tube.

13. The photoacoustic detector of claim 11 wherein the connector between the acoustic pressure sensor volume and the sensing volume is placed in close proximity to the acoustic pressure attenuating element.

14. The photoacoustic detector of claim 11 wherein the connector between the acoustic pressure sensor volume and the sensing volume is placed

near a corner of the sensing volume in close proximity to the acoustic pressure attenuating element.

15. The photoacoustic detector of claim 11 wherein the connector between the acoustic pressure sensor volume and the sensing volume is placed near an edge of the sensing volume in close proximity to the acoustic pressure attenuating element.

16. The photoacoustic detector of claim 11 wherein the diffusion rate of the analyte gas from the sensing volume into the acoustic pressure sensor volume through the connector is less than the diffusion rate of the analyte gas from the environment into the sensing volume through the acoustic pressure attenuating element.

17. The photoacoustic detector of claim 11 wherein the connector between the acoustic pressure sensor volume comprises a flexible membrane.

18. The photoacoustic detector of claim 11 wherein the connector between the acoustic pressure sensor volume and the sensing volume comprises a rigid membrane mounted in a flexible support.

19. The photoacoustic detector of claim 11 wherein the sensing volume and the acoustic pressure sensor volume are similar in size.

20. The photoacoustic detector of claim 11 wherein the sensing volume is less than the acoustic pressure sensor volume.